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HISTORIC MOUNTAIN-PASSES OF THE WORLD

By MINNIE J. LANGWILL

St. Charles, Illinois

A RECENT traveler in northern India, near to where the eastern empire abuts upon Afghanistan or Tibet, inquired of a native official how it was that the British came to occupy the country, especially as it was approachable only through a narrow pass in the mountain boundary. The reply was significant: "First missionary, then trader, then army."

Leaving out the first named, who, inspired by the most powerful and sacred impulse to action—a divine command—would risk everything to go anywhere when duty called; we observe that traders and home seekers are the world's real pioneers and unconscious apostles of civilization, and that these natural features—mountain-passes—have rendered the way open and available for that mighty force which makes for human education, social uplift and general betterment—commercial intercourse between different nations.

To migrating, warring, and trading humanity, the mountain range presents only a challenge to their energy and endurance, and in searching for the lowest dip in the crest by which to cross, men have found those natural features, the mountain-passes. Here their interest centers, for they point the easiest pathway to the country beyond the mountains, and for this reason become the focus of all the great highways on either slope as well as that of the side valleys within the mountains themselves.

TYPES OF PASSES

There are several orders of passes; those which have served chiefly as military routes, some whose functions have been to make possible commercial intercourse among different countries, again there have been passes used principally as pioneer trails, while still others because of their particularly advantageous position, strategic and economic importance have been utilized for all of the above purposes.

The Mohawk Depression exemplifies this latter type and presents one of the best illustrations of the physiographic control over man which the New World can supply. Being in the United States the only decided break in the whole length of the Appalachians together with its ready accessibility it became an important factor in the early colonies, as well as in the later history of New York. The Mohawk Depression, which is the valley of the Hudson and Mohawk Rivers, is called the eastern gateway of the United States. It

is a gap 1500 to 2000 feet deep and nearly 100 miles long with its upper slopes several miles apart, lying between the uplands on either hand. This highway up which moved the French, the English, the Dutch and the German immigrants, was the natural route of communication with the Great Lakes and was one of the routes by which the colonists tapped the fur trade of the Northwest. In later days this depression rendered possible the Erie Canal and the resulting commercial dominance of New York City.

Likewise *The Alpine Passes* owe their value in large measure to their connection with the natural highways which are found in river basins. They are flanked by the Po, the Rhone, and the Danube; hence in historic and commercial importance they have been the most significant features of Southern Europe. They served as military roads for the passage of armies from the time of Hannibal to that of Napoleon; later they became thoroughfares for the exchange of the products of the tropical Mediterranean, and the Orient, with the temperate regions of Europe. Trade and travel between Italy and her ports and Northern Europe was carried by the great mountain highways crossing the Alps at the Splugen, Mt. Cenis, the Brenner, the Simplon, the St. Gothard and Bernard passes.

These nature-made thoroughfares over which first came the barbarians, next well drilled troops, then travelling merchants are having their significance threatened by the coming of the railroads which are slowly but steadily rendering the summits of the Alps accessible even to the paralytic. The Alpine passes which are approached by a single valley from each side are those crossed by railroads today,—Mont Cenis, Simplon, St. Gothard, and the Brenner. The last mentioned is the lowest and has been one of the most frequented passes across the Alps in all ages; it has been called the gate of Italy and by it most of the Teutonic tribes made their way to Italy. It was crossed no fewer than sixty-six times by various emperors between 793 and 1402. A carriage road was constructed over it as far back as the middle of the eighteenth century, while the railroad over it was built in 1864. Thus the Brenner has seen the march of progress from the time of the Roman road-makers to the modern engineer. Its influence has been far reaching, for by its mediæval trade was made possible the commercial greatness of Augsburg, Ratisbon, Nuremberg and Leipzig in the north and it promoted the growth of Venice in the south.

The stories of Napoleon's campaigns of 1794-1800 center around the Alpine passes. In his plan of march to Milan it was his purpose to descend by the Splugen and the St. Gothard to the plains of Lombardy but, persuaded by one of his generals, he abandoned the idea of using the Splugen and the St. Gothard and turned his attention to the more westerly passes, the Great St. Bernard and the Simplon.

Over the *Great St. Bernard* in the days of the Roman Empire there

was an established route leading from Martigny in the Rhone Valley to Aosta in Italy. The hospice on the pass was founded in the eleventh century by St. Bernard of Menthon and since the twelfth century has been in charge of Austin Canons. Annually the servants of the canons and the famous dogs save many lives. When Napoleon crossed this pass it was traversed by a bridle road only.

St. Gothard Pass is the principal route from northern Europe to Italy. It takes its name from St. Gothard, bishop of Hildesheim but does not seem to be mentioned before the thirteenth century, perhaps because the access to it lies through two very narrow Alpine valleys, much exposed to avalanches. The hospice on the summit is first mentioned in 1331. In 1775 the buildings near it were damaged by an avalanche, while in 1800 everything was destroyed by French soldiery. Rebuilt in 1834, the hospice was burnt in 1905. The mule path (dating from about 1293) across the pass served for many centuries; the carriage road was not constructed until the years between 1820-1836. Now the pass is deserted in favor of the great tunnel pierced in 1870-1880; it is nine and one half miles in length and attains a height of 3786 feet. Through it runs the railway, opened in 1882, from Lucern to Milan, one of the greatest engineering feats of the nineteenth century. In 1909 the Swiss government bought the St. Gothard railway from the company which built it.

The Simplon Pass was not known early save as a purely local route, but it took a Napoleon to bring it into prominence by causing a carriage road to be built across it between 1800-1807. The Simplon Road was the first great Alpine route after the Brenner. The construction of the splendid road over the Simplon, which when completed was the wonder of the day, was decided upon by Napoleon immediately after the battle of Marengo, while the recollection of his own difficult passage of the Alps by the Great St. Bernard was fresh in his memory. The project of a railway tunnel under the Simplon first occupied the attention of engineers about fifty years ago. It was indeed the first route projected for an Alpine tunnel, but those through Mont Cenis and St. Gothard were completed before work on the Simplon was commenced. The railway line through the wonderful tunnel of the Simplon is now completed and one of the most picturesque mountain passes in the world is abandoned.

The Cumberland Gap and South Pass.—In contrast to the passes just described are those which have been used chiefly as pioneer trails like Cumberland Gap and South Pass. The former is a pass through the Cumberland Mountains on the state line between Kentucky and Tennessee, on the south western end of Virginia, furnishing the natural avenue through which Daniel Boone laid his road in 1769 and over which passed the emigrants from Virginia to Kentucky and the West. James Lane Allen writes regarding this mountain pass, "That high-swung gateway through the mountains stands as a

land mark of what nature can do when she wishes to give an opportunity to the human race in its migration and discoveries without surrendering control of its liberty and its fate".

South Pass, a gap 20 miles in width, was discovered by trappers in the Rocky Mountains not far from where the forty second parallel intersects the continental divide. South Pass was called the gateway to Oregon and over it led the Oregon Trail, the highway for the pioneer wagons of the Western Settlers. The trail extended from the Missouri and Platte Rivers not only to Oregon but to Great Salt Lake and California.

Famous Passes of Asia

Bolan Pass located in the north eastern part of India for centuries furnished a passage for caravan trade from Turkestan to India. In places along the Bolan Route, conglomerate cliffs, inclosing the valley, rise to a height of 800 feet, and in other places the passage between the limestone rocks hardly admits of three persons riding abreast. The temperature of the pass is very high in summer, whereas in winter, near the head, the cold is extreme and the ice-cold wind, rushing down the narrow outlet, becomes destructive to life. Today a railroad traverses Bolan Pass but no trade of importance exists.

Gomal Pass is the most important on the Indian frontier between the Khaibar and the Bolan. It has for centuries formed the outlet for the Porindah trade. The traders followed this route in their annual journey to and from India with merchandise and encountered considerable peril from robber tribes that persistently beset their paths through the passes. Gomal Pass still carries the main traffic road over the border mountains between the Punjab and the Afghan city of Ghazni.

Dariel Gorge and the Khaibar belong to the class of passes used chiefly as military highways. The direct route from Peshawer to Kabul lies through the Khaibar for a distance of 190 miles. The pass itself, thirty-three miles in length, is a narrow defile winding between cliffs of shale and limestone six hundred to one thousand feet high, stretching up to more lofty mountains behind. It lies for the most part along the bed of a torrent, often filled with a sudden fall of rain. At other times the bed is dry, or the water shrinks to a small rill, sometimes disappearing under the gravel. No other pass in the world has possessed such strategic importance or retains so many historic associations as this gateway to the plains of India. It has seen Persian and Greek, Tartar and Mongol conquerors with the hosts of Alexander and other warrior chiefs pass and repass through its rocky defiles for a period of more than two thousand years. It has been the scene of deadly struggles with British forces during the first Afghan campaign with its series of successes, disasters and final triumphs. The whole of Khaibar Pass is now recognized as under British rule and its difficulties are overcome by British engineers; it has been adopted by the English government as the main road to Kabul.

Dariel Gorge, called by Pliny the "Caucasean Gates," is reached by a road cut most of the way in the face of the precipice. The mountains rise on each side 3,000 feet as nearly perpendicular as rocks can stand, and the river Terek dashes through a gorge so narrow that in ancient times it is said to have been closed by a gate. The ruins of a castle which formerly defended it still remain, while a new castle marking the Russian era is more useful as a summer resort than as a present defense. Not only is the pass celebrated for its scenery but for the thrilling events of modern history with which it is connected. It was here that 200,000 to 300,000 mountaineers with their limited resources held at bay the mightiest military power in the world. The marvel is that the Russians were successful. However, the last stronghold of the mountains was captured, the tribes submitted and peace and prosperity have since reigned there.

GOLD

By C. L. Dake

Missouri School of Mines and Metallurgy, Rolla

WHILE Aluminum makes up approximately 7.84 per cent and iron 4.44 per cent of the earth's crust, it has been estimated that gold is present in an average amount of less than .0000001 per cent. Though the amount is extremely small, gold is very widely distributed in these small quantities, being found in traces in nearly all kinds of rocks, and in most localities.

The oceanic waters contain appreciable quantities of the metal; an analysis from Kristiana Fiord, Norway, shows approximately .0000005 per cent and one from San Francisco Bay about .0000011 per cent of gold in solution. With these figures as a basis, it is computed that the sea would contain between 5 and 15 billions of tons of gold. Many schemes have been promoted and much money lost, trying to extract gold from sea water, although up to date, no paying method has been discovered.

Gold usually occurs as native or metallic gold, but is sometimes combined with a rare element called tellurium, as a group of compounds known as the gold tellurides. Most of the gold of the Cripple Creek District of Colorado is in the form of the tellurides. No other compounds of gold are known in nature.

Modes of Occurrence

Gold ores occur in three types of deposits, known respectively as fissure-veins (or veins), replacements, and placers, each of which will be described briefly.

Fissure Veins.—When the earth's crust is warped and bent under the force of internal stresses, it frequently happens that open cracks are formed. Within the upper portion of the earth's crust, water is in constant circulation, and this water always carries more or less mineral matter in solution. Due to certain chemical processes, this mineral matter is often deposited in

these open fissures, partially or completely filling them. Such fissures filled with mineral matter are termed veins, or fissure-veins.

Although gold is usually considered very insoluble, it is known to be dissolved in nature by waters carrying certain compounds of manganese, or ferric (iron) salts, or alkaline sulphides. Other natural solvents for gold probably exist. That gold is actually carried in solution in nature is proved by the fact that the waters of Steamboat Springs, Nevada, show traces of the metal.

In many localities, these circulating waters have dissolved minute quantities of gold from some unknown source and redeposited it in the fissures, along with many other metals, chief among which are quartz and iron pyrites. These constitute the gold-bearing fissure veins of so many of our western gold districts. Of this type are the famous "Comstock Lode" of Nevada, and the "Mother Lode" of California, *lode* being the miner's term for a system of parallel veins. Such veins vary from a fraction of an inch to several hundred feet in width, and from a few inches to many miles in length.

Replacement Deposits.—It sometimes happens that instead of being deposited in open cracks or fissures in the form of veins, the gold with its accompanying quartz and pyrite, forms irregular shaped deposits replacing other rocks. In such cases, there are no actual open cavities or fissures in the rocks, but the solution carrying the gold actually dissolves away a little of the solid rock, *and at the same time replaces it with gold and other minerals.* Such deposits are said to be replacement ores, because they replace (or take the place of) the enclosing rock. Replacement deposits are by far the most common in limestone, because limestone is very soluble, and most easily removed by the gold-bearing waters. Other rocks are often, though to a less extent, replaced by ore in the same way. Replacement frequently accompanies fissure veins, the actual fissure being filled by vein material, and the ores extending out irregularly into the wall rocks, on one or both sides of the vein. The Homestake mines in the Black Hills of South Dakota are well known and important replacement deposits of gold.

Gold Placers.—When a gold bearing vein outcrops (is exposed) at the surface, weathering and erosion break up the rocks, and they are carried away by streams, the gold mixed with the gravel. Gold (sp. gr. 19.33) is about 5 to 8 times as heavy as the gravel, and so settles to the bottom of the stream, and the lighter sands and pebbles are washed away. In this way, gold from a great deal of rock may remain behind, and be concentrated in a small area in a creek bed. Deposits of this type are known as *placers.* Very much placer gold has been secured from California, along the gravels of the stream beds, in the vicinity of the great vein system known as the Mother Lode. The placer deposits are the residue from the weathering and erosion of the gold-bearing quartz veins of the vicinity. The placer gold was the first

to be discovered, back in the days of '49. It was reasoned that this gold came from veins farther up the streams, and later search located the Mother Lode, the source of the placer gold.

Sometimes the washing of ocean waves against a shore in which there are gold-bearing veins carries away the lighter sand and gravel, concentrating the gold on the beach, on the same principle as in the case of river placers. The very rich placers along the beach at Nome, Alaska, are in part probably due to wave work.

Ultimate Source of the Gold

The question naturally arises at this point, "But where did the underground waters get the gold which they deposited in these fissure veins and replacement deposits?" To this question we cannot give a very satisfactory answer. In some cases the waters may have dissolved the very small amount of gold in the surrounding rocks and brought it together in veins. In other cases there is clear evidence that volcanic activity has brought up deep-seated molten rock and much heated water, and that the gold came up, dissolved in the hot waters. The fact that in many districts the gold is found closely related in distribution to the once-molten rocks, and that many of the minerals mixed with the gold are known by laboratory experiment to be formed only at high temperatures, leads almost certainly to the conclusion that in many cases the gold of veins and replacement deposits is related to some type of volcanic activity.

Gold Mining

In the case of veins and replacement deposits, mining is usually carried on by underground methods. A vertical or inclined shaft is sunk on or near the vein, long tunnel-like openings called drifts are driven parallel to the vein, and at frequent intervals, openings called cross-cuts are driven at right angles to the drifts, to intersect the vein. In the Comstock Lode of Nevada, mining of this sort was carried to depths of over three thousand feet, and on the Witwatersrand of South Africa, to about a mile.

The grade of ore which can be mined profitably depends on many factors, such as the depth of mining, cost of transportation, cost of fuel for smelting, state of the market, etc. The grade of a gold or silver ore is expressed in ounces of gold troy weight per ton of ore avoirdupois. Under extremely favorable circumstances an ore as low as 1-10 oz. gold per ton can be mined. This would be about 1-300 of 1 per cent of gold, or at the present market price, a ton of such ore would contain about two dollars' worth of gold. Under ordinary conditions, such ore would be of no value, and ores are not usually worked for less than ¼ of an oz. of gold per ton.

Placer mining is carried on in several ways. One of the most primitive and widespread is the washing of the gravel in a shallow miner's pan, by hand. This method is used largely in prospecting, and an improvement on it, in the nature of a cradle, or hand-rocking washer, is usually used in the

opening up of new camps. When a good head of water is available, it is carried in pipes; a stream under great pressure being directed against a gravel bank, the gravel is undermined and washed into sluice boxes, in the bottom of which is quick silver, to catch the heavy gold that settles to the bottom of the trough. Such a method is called *hydraulic mining*. Sometimes a steam dredge is used on navigable rivers.

Under fair conditions, placers can be worked, when the yield is from 7 to 10 cents in gold per cubic yard of gravel, an ddredging sometimes pays at as low as 5 cents per cubic yard. In parts of Alaska, where most of the gravel has to be thawed by steam pumps, such low values can not be worked at a profit.

In places in California, volcanoes have poured out thick lava flows over old placer gravels, burying them deeply, and at the present time these gravels are mined by tunnels running under the lava beds. Placer deposits have been formed in past geologic times as well as at present. By most geologists, the South African deposits known as the Rand, or more properly as the Witwatersrand, are believed to be very ancient placer deposits now buried deeply under later sediments. The gravels of these ancient placers have become solidified into a conglomerate rock.

Metallurgy of Gold

Metallurgy treats of the process used in recovering the metallic content of ores. Gold is often obtained as a by-product in the treating of other ores. The copper of the Butte, Mont., camp yields a great deal of gold, and the copper of most camps yields small amounts. Lead ores often yield much silver, and a little gold, as at Leadville, Colorado, and Coeur d' Alene, Idaho. So closely associated are gold and silver ores that very many important camps of the one metal produce considerable quantities of the other.

In the case of placer gold, the metal is separated simply by mechanical washing. If it is still too impure, by being mixed with other heavy metals, the mixture is made to flow with water over quicksilver, which has a great affinity for gold and separates it from the other metals. The amalgam, as it is called, of gold and quicksilver is then heated, by which means the quicksilver is driven off leaving the gold behind.

In vein deposits, free native gold is often mixed with quartz,—the gangue, as the veinstuff is called. Such ores are crushed under heavy hammers, known as stamp mills. At the same time they are mixed with quicksilver, which collects the gold, forming an amalgam which adheres to the copper plates of the stamp mill. From this amalgam, the quicksilver is driven off by heat, as before, leaving the gold. This is known as the amalgamation process. Ores of this type are said to be "free-milling," and do not need to be smelted.

It often happens that the gold, though not chemically combined, is mixed with much iron pyrites. Such ore is called an auriferous (gold-bearing)

pyrite. Other ores contain gold in combination with tellurium, as gold tellurides. Such ores are much more difficult to treat.

Ores of this type are often treated with a chemical known as potassium cyanide which has the power of *dissolving* the gold out of the ore. From this solution the gold may be recovered by filtering through charcoal, or by putting zinc into the solution, which causes the gold to be deposited. This is known as the cyanide process.

Another, known as the chlorination process, involves the use of chlorine gas (one of the constituents of common salt) which unites with the gold to form a soluble compound easily leached from the useless rock. By the use of other chemicals, the gold is then caused to be deposited from the solution. Gradually this process is being replaced by the cyanide process. At one time, much common salt was employed in the chlorination of gold ores.

The gold recovered by these processes is usually not pure, being alloyed with baser metals. The refining may be done by chemical or by electric means.

Uses

Gold is used chiefly in coinage, jewelry, and ornamental utensils. Smaller amounts are employed in dentistry, photography, gilding, and the manufacture of stained glass. So malleable is gold, that the gold leaf used in gilding is beaten to a thinness of 1/250,000 of an inch. For most purposes, gold is too soft to wear well, and it is usually alloyed with other metals. Copper gives the alloy a redder, and silver a whiter color than the pure gold. The purity is expressed in carats (parts per 24) so that 24 carats is pure gold, and 18 carats 18/24 gold and 6/24 other metals.

World's Production—1911

Country	*Value in Dollars*	*Per cent U. S. Production*
Africa	192,972,100	41.3 per cent
United States	96,233,500	20.6 per cent
Australasia	59,187,900	12.7 per cent
Mexico	29,196,000	6.3 per cent
Russia	24,865,000	5.3 per cent

No other country produces as much as two and one-half per cent of the world's gold.

Production of U. S. for 1911

Country	*Value in Dollars*	*Per cent U. S. Production*
California	19,928,500	20.5 per cent
Colorado	19,138,800	19.7 per cent
Nevada	18,096,900	18.6 per cent
Alaska	16,665,200	17.2 per cent
South Dakota	7,429,500	7.6 per cent
Utah	4,486,200	4.6 per cent
Montana	3,649,700	3.7 per cent
Arizona	3,521,400	3.6 per cent
Idaho	1,357,900	1.4 per cent

No other state produces as much as one per cent of the output of the United States. In all, twenty-three states reported a production in 1911.

References.

RIES, HEINRICH, *Economic Geology of the United States.*
CLARKE, F. W., *Data of Geochemistry;* Bull. U. S. Geol. Survey, No. 491.
U. S. GEOL. SURVEY, *Mineral Resources of United States.*
REMSEN, IRA, *College Chemistry.*
KEMP, J. E., *Economic Geology,* Vol. I.

REMARKS ON GEOGRAPHY IN AMERICA*

By ALBERT PERRY BRIGHAM
Colgate University, Hamilton, New York

GEOGRAPHY in American universities is generally under the wing of geology, and hence physical geography is more fully developed than other phases. Out of three or four hundred schools of a more or less advanced type, a score or two have been distinctly impressed by the geographic progress of the past twenty-five years. The ratio of numbers does not however mark the measure of progress, for there is a widening conviction in universities that geography is a worthy subject and ought to be taught. If twenty of the major universities be named, some give full place to geography and others wholly ignore it. One of these schools has a professor of geography, but apparently offers no instruction. Cornell University has a department of physical geography, though the late head of the department went much beyond this and in his courses and his investigations was working steadily into the realm of human geography. Chicago has four teachers of geography of professional rank, and offers more than twenty courses, including the geography of most of the continents, the influence of environment, cartography and the principles and history of geography.

Yale puts geography under the head of geological science, but gives large recognition to the subject, including physical and commercial geography, anthropogeography and courses on North and South America, Europe and Asia. The instructors have specialized to a considerable degree by exploration in the continents assigned to them. Harvard has a department of geology and geography, and offers courses in the physical geography of the United States and Europe, in the regional geography of South America, and in geomorphology, elementary and advanced. The relation of physical conditions to life is emphasized in the courses in climatology.

Wisconsin also relates its work intimately with geology but gives many geographic courses. These embrace elementary physiography, physiography of

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the United States, physical geography for commerce students, economic and agricultural geography, advanced physiography, oceanography, glaciers and glaciation, advanced geography, the teaching of physical geography, the relations of geography and history, meteorology and climatology, regional work on Wisconsin, on North America, and a general course on all the continents, as well as much field work.

The University of Nebraska has a department of geography and offers a full and symmetrical range of courses, including physical geography of the land and regional treatment of North America, Europe and Asia. It also offers industrial and commercial geography, methods in physical geography and methods in general geography, with field and laboratory work. Nebraska emphasizes in an important way the preparation of teachers for the lower schools.

The University of Pennsylvania does a large work in practical geography, offering a variety of instruction, in the Wharton School of Finance and Commerce. Here such subjects as transportation, resources, industry and commerce have the chief place. Columbia gives several courses in the University and in Teachers College, the former recognizing more fully the scientific, and the latter the educational phases of the science.

In all the schools thus far named the subject may be taken as a major for the doctor's degree. Some of the state universities, such as those of Illinois, Indiana and Missouri, recognize the subject in a minor way only. The University of California offers a considerable range of geographic work, while its neighbor Stanford University does not go beyond physiography. Several other colleges and universities teach geography to a limited degree not because the subject appeals to the governing bodies or to the faculties as a whole, but because of the special interest of instructors. In these cases we may assume that more instruction would be given but for limitation of time and because most of the work must be given in the field of geology. In this category may be named Northwestern University, Oberlin College, Denison and Syracuse Universities, Beloit College, Williams College, Wesleyan University and Brown University. At Colgate University geography is given in the department of geology and includes physiography of the United States from the point of view of environmental influence, commercial geography, the geography of Europe and such related subjects as glacial geology and the geology of the human period.

Several of the oldest and strongest colleges give students seeking general training, opportunity to study mineralogy, microscopic petrography and paleontology, but deny to them instruction in the physical features and resources of the world, and ignore the vast and splendid field of environmental influence on life and human history. It must not however be inferred that progress is small, or that hope is to be too long deferred, for there is a prevailing admission that a new geography has come and that the doors of the higher schools must open to it.

During the past twenty years a large number of teachers from secondary and elementary schools have gained a new outlook on geography in the summer sessions of various universities. For many years the *Journal of Geography* has, through the work and devotions of its editors, promoted the progress of geographical teaching. Societies, such as the American Geographical Society, the National Geographic Society, and the Geographical Societies of Philadelphia and Chicago, have each in their own way done much for geographical progress. The Association of American Geographers is a late comer in the field but for the past nine years has led the way in establishing an expert standard of membership and it now includes a large share of the mature and professional geographers of the United States.

Whether considered from the point of view of research or of teaching, geography opens a realm of bewildering magnitude. That all should know geography appears in the universal recognition of it as a cardinal subject in the lower schools. Yet the results are often distressing in the grades because of poor teaching and limitation of time. There are individuals high in educational administration who know so little of geography as to suppose that it may be finished in the sixth grade and that the boy of twelve may be turned loose with all needed knowledge of the world in which he is to live and work. Geography will not get its true rating until it gets it in the fountains of knowledge, the higher schools.

More than elementary training is imperative for many kinds of people. These include teachers of geography in the elementary, normal and high schools and all whose business relations extend across the boundaries of state and nation. All who have to do with legislation and civil administration need geography for they deal with social, industrial and commercial conditions that touch all men. It is poorly appreciated today but will in time be fully known that all special students and teachers in the fields of history, politics, economics and sociology need the highest type of university training in our science. Nor can we omit the journalist, who is under peculiar bonds to know the world as it is and to speak with reasonable authority concerning the events of all nations.

Nor is our enumeration at an end. A multitude of public teachers, preachers and lecturers in various fields too often essay their task ignorant of nature and its manifold relation to man. We include all who travel for their own profit and that of others, many government employees in practical bureaus and in the consular service, in short every thoughtful man and woman, for their outlook on life, for their intellectual satisfaction and their efficiency as members of society. Experience shows with woeful certainty, that such knowledge does not come by accident, or by unconscious daily absorption from books, newspapers and people.

I do not know a better place to speak for geography than here. We are upon the fertile and beautiful Piedmont, in the midst of one of the oldest

civilizations in America. No state more than Virginia, by its plains and mountains, its tidal rivers and bordering seas, exhibits the effects of environment on the course of human events. Near at hand is the ancient mansion of Monticello, which speaks to every true patriot of the man who sent the star of American empire far westward, and whose name enshrines principles that profoundly concern American life for all time to come. We may arrive at more philosophical definitions of geography, but we shall not suffer, if with all diligence, we give ourselves to the study of the Earth as the home of man.

THE JAPAN CURRENT AND THE CLIMATE OF CALIFORNIA*

By WILLIAM G. REED
University of California

THE Supposed relation between the climate of California and the Japan Current appears in the newspapers from time to time. In some way not clearly stated this current is held to have a profound effect upon the climate of the state. The Japan Current is an ocean stream of considerable interest and importance, but it is not a great factor in the climatic conditions of California.

Streams of water of higher or lower temperature than that of the neighboring ocean have been a source of unfailing interest from the earliest times. As is always the case when there is great interest in any natural phenomenon the general information in regard to these oceans currents is not all accurate. To the famous Gulf Stream of the North Atlantic Ocean and the corresponding current in the North Pacific, *Kuroshiwo,* the Japan Current, have been ascribed many things, particularly the climatic features of California and of Europe.

The existence of currents, or better, "drifts," in the oceans of the world is universal, and all the oceans have these drifts flowing in conformity with the same general scheme, which is a movement toward the west near the equator, toward the poles on the western side of each of the five great oceans, then turning to the northeast in the northern and to the southeast in the southern hemisphere in the vicinity of latitude 30° to 40°, and, finally, a movement toward the equator in the eastern portions of the oceans. Thus each of the oceans has its own drift, those of the northern oceans turning in the same direction as the hands of a watch and those of the southern oceans turning in the opposite direction.

The main cause of these drifts in the oceans is to be found in the prevailing winds of the world. Within the tropics the winds blow from the east toward the west throughout the year, the famous "Trades." The prevailing direction over the oceans not within the tropics is from west to east.

*Reprinted by permission from the *Sierra Educational News*, Nov., 1913.

The winds continually blowing across the oceans set up a movement of the water in the same direction as they blow. Were the movement of the water not interfered with by the continents, there would be three streams around the earth, one in the tropics from east to west, and one in each of the temperate zones from west to east. The position of the continents, however, is such that the water surface of the earth is divided into separate ocean basins and the shores of these basins modify the simple wind-driven currents and make them the ocean drifts as we know them.

Currents are designated as warm or cold, not from the actual temperature of the water of which they are composed, but merely from their temperature as compared with that of the surrounding ocean water. If the temperature of a current is higher than that of the ocean through which it flows, this stream is known as a warm current; if the stream has a lower temperature than the surrounding ocean, it is known as a cold current. From the foregoing it will be seen that no current can be said to be warm or cold unless its location is known. A current which is flowing along a latitude line cannot have a temperature far different from that of the surrounding ocean and, hence, cannot be said to be either a warm or a cold current. This is the case with the currents in the tropics. A current which flows away from the equator and thus transfers the warm water of the tropics into the colder oceans of the temperate and polar zones is a warm current, but the actual temperature of its water becomes lower and lower as the distance from the equator increases, so that in high latitudes the current has a temperature much lower than the general temperature of the tropical oceans. A current flowing toward the equator is bringing the colder water of the high latitudes into the warmer oceans of the temperate and tropical zones, and is, therefore, a cold current, although its actual temperature by the time it reaches the tropics is far above that of the ocean in which it started.

From this it may be seen that each of the great oceanic drifts is in part a warm and in part a cold current. When the drift is within the tropics it can properly take neither designation; but, when it leaves the tropics and begins its poleward and eastward journey, it becomes a warm current, and remains such until it turns equatorward again. When the current is at its greatest distance from the equator it may be so much warmer than the surrounding ocean that an equatorward journey of a little distance may be necessary before the temperature of the surrounding ocean is reached. But the currents travel so slowly that in no case is the distance very great, and that part of the drift which is flowing toward the equator in the eastern portion of the ocean becomes a cold current.

All this applies to that part of the North Pacific Drift known as the Japan Current and the relation of this great ocean stream to California. The Japan Current is, properly, that part of the drift which is warmer than the surrounding ocean; it is a warm current. As such it has its beginning in the

Pacific Ocean southeast of Japan, where the drift turns from a westerly to a northerly course, and flows to the north and then to the northeast to the Gulf of Alaska, where it divides into two branches, one continuing as a warm current through the Aleutian Islands and the other turning to the south to become the somewhat indefinite California Current. The California Current flows southward at some little distance from the western coast of the United States and the water which has left the tropics as the Japan Current is replaced by the California Current, so that the tropical ocean may not be losing water continually to the Alaskan region without adequate return to keep the amount of water in each place constant.

Near the coast of California the water is decidedly colder than it is in the open ocean, but as this coast strip has a lower temperature in the vicinity of Cape Mendocino than it has either north or south of this point, the cold strip must be the result of an upwelling of cold water from the depths of the ocean and not the result of an ocean current. The reports of vessels show that the movement of the surface of the ocean near the shore is irregular, but that farther out there is a general movement toward the equator.

The facts of observation show that the Japan Current does not come within nine hundred miles of any part of California, and consequently can have little influence upon the climate of the state. But it is a fact that the climate of California is much milder than that of the greater part of the United States. The explanation is to be found in the great ocean which lies to the west and in the fact that the winds prevailingly blow from this ocean to the land. The temperature of the ocean water varies little from 55° during the year; in some places it is more and in some places less, but it is everywhere relatively constant through the year. The air lying over this great body of water has nearly the same temperature as the water, but were it not for the westerly winds, the climate of California would be little influenced by the ocean.

Compared with the land areas in the same latitudes the oceans have very mild climates. Everywhere the oceans are warm in winter and cool in summer, because water is of all the substances we know among the most difficult to heat and to cool. The result is that the temperature of the ocean and the air over the ocean remain nearly constant. But land is about twice as easy to heat and twice as easy to cool as is water, so that the land and the air over it have warm summers and cold winters, warm days and cool nights.

The fact that the winds blow from the ocean to the land is of the greatest importance to California. It is these winds which bring the mild ocean air over the land and give to this state a climate cooler in summer and warmer in winter than that of other parts of the country. The Pacific Ocean and the westerly winds from the ocean can and do produce all the beneficial results that have been claimed for the Japan Current, and it is to these two features of Nature that we owe our mild climate. Whatever effect the

Japan Current may have upon the Gulf of Alaska and upon the climate of the Territory of Alaska, and there is no doubt that this effect is very important, the State of California owes nothing to this warm current. The cool summers in the coast region of the state and the fogs which occur during that season are, in part, due to the presence of the cold water off the coast, and that part of the North Pacific Drift known as the California Current may be one of the reasons for the existence of this cold water, although a far more important reason seems to be the upwelling of the cold water from the ocean depths. It is the Pacific Ocean and the westerly winds to which we must look for the chief reasons why the climate of the Golden State is favored above that of other lands.

NOTES ON WALL MAPS

By ROBERT M. BROWN, Rhode Island Normal School, Providence

THERE is a tendency among map publishers abroad to multiply the number of maps in a series so that instead of a single map of a country, as Europe, eight or ten maps are issued. This is in response to a pedagogical principle evolved at the expense of much time both to teachers and to pupils who have attempted to read maps containing a number of items and conveying no very definite idea because of the "confusion of tongues." The best expression of this tendency appears in the Vidal-La Blanche's maps published by Armand Colin, Paris. The series comprises a large number of maps which are printed on heavy paper and because the publishers have omitted expensive mountings and the author has limited the details of the maps, any map of the set can be obtained at a cost of one-tenth to one-fifteenth the price of many wall maps now offered by publishers. On the other hand, unless care is taken the maps will not last as long as the roller type, nor are they of a very convenient size to store unless folded, a process which soon destroys a map. These maps, however, illustrate so many points which should be demanded by teachers who use wall maps that they are taken as a basis for emphasizing a few principles which are almost self-evident.

1. A wall map should display its features in such a way that they can be seen from every part of the room.

(a) We have discarded, in this country, the map with the glazed surface but at least one foreign map publisher still issues this type of map. Whatever may have been the origin of this surface finish, it is unnecessary today and the inherited maps of this kind even yet in use in some schools should be replaced. Every one who has had experience with the glazed surfaces knows that when the light strikes it at certain angles, the details are obscured.

(b) Names in small type, especially if they appear in numbers, tend to confuse. The Vidal-La Blanche series comprise for France a number of maps of which three illustrate this point. The first map is a topographic map of France in four colors without names; the second is the same map with the

names of the physiographic divisions printed on it in letters large enough to be read across the school room; and the third is the same map with the names of the rivers printed on in the same size type. It may not be generally admitted that it is best to print the names on a map but at least it is true that if it is done at all it ought to be done with judgment. Many maps used in our schools as wall maps are covered with names in type too small to be read by the teacher from her position a pointer-length away.

2. Maps should be used which follow the international color scheme. There is the same advantage in using a uniform color or sign on maps as there is in using a uniform combination of letters to stand for a certain concept. For the younger children the advantage becomes an imperative demand. To jump from a map where the states are colored green and brown to a map where elevations are brown and lowlands green is not economy, if it is not detrimental.

The best wall maps use shades of blue for oceans, the deeper shades for the greater depths, and blue for all inland bodies of water, as lakes and rivers; shades of brown for altitudes, the deeper shades for the greater heights; green for lowlands; and white or light yellow for all intermediate heights.

(a) A recent series of maps published in this country has the following legend on the North American sheet: white, 0-1000 feet; yellow, 1000-3250 feet; orange, 3250-6500 feet; brown, above 6,500 feet. The South American sheet of the same series prints and uses the legend: white, 0-1000 feet; green, 1000-3250 feet; orange, 3250-6500 feet; brown, above 6,500 feet. The North American map is distinctly yellow and the South American, green. Such an utter disregard for a simple principle of pedagogy should mark this series as undesirable for the school room. (b) The early attempts to follow an international color scheme resulted in some cases in a failure to obtain the proper value for the colors. Thus, one German map over-emphasizes the brown and another the green shades so that these attract an undue amount of attention. Later maps have corrected this fault. (c) Considerable confusion has resulted from the old type of maps because the locations of cities were not designated with sufficient emphasis. Teachers have allowed pupils to point to the name of a city rather than to the exact location. That this is a mistake is proved by the uncertainty which older pupils have in locating places on small maps. The tendency for some is to place the city at the beginning of the name and for others at the end, while the small and somewhat insignificant dot is altogether neglected. The newer maps are overcoming this by indicating the location by a circle or dot large enough to be seen from the seats. It is doubtful whether there is any advantage in printing the name of a city on a general wall map. The name, however, is frequently indicated by the initial letter or a number without destroying the effectiveness of the map.

3. It is, in general, a mistake to attempt to show many things on a single map. Our old maps which attempted to show physical and political divisions have been the cause of a great lack of appreciation of maps. They seem to have impressed the pupils in American schools with a feeling of the futility of maps as a whole. This is the problem which the present generation of teachers in this country must face. There is no momentum from the past; on the contrary, the work of previous generations is a distinct impediment. It is in this particular that the idea of publishing maps of each country in series promises advancement. It is possible to buy at a low price a set of eight maps of Europe, each map devoted to a single idea and the whole making as near a complement as can be found.

(a) A physical wall map is more valuable than a political. The only wall map of India which could be bought a few years ago was a political map and it is questionable whether it was ever worth while to display it. It ought to be said, however, that the map was published by an English house and the emphasis on colonial geography by Europeans might constitute a reason for its publication. The same publisher has recently issued a physical map of India which ought to find a ready sale in this country.

(b) Political divisions are frequently indicated on physical maps by heavy lines, often in red, and when done with care, the effectiveness of the map does not suffer.

4. The step from work based on a physical wall map to the charting of information on outline maps in color should be taken more considerately. This topic is capable of much expansion, but it is sufficient to suggest that a too early introduction of this work or too great an emphasis upon it may detract from the main theme of map work.

CURRENT INFORMATION ABOUT MEXICO

Mexico and the Mexicans

"THE Mexican Constitution is always what it means to that man on horseback who has behind him enough men with muskets to certify that he understands it."

"The Mexican Congress is a handpicked legislature, carefully made up in a great part of adherents of the President for the time being. Even such a Congress sometimes finds the courage to assert its constitutional rights and to criticise the conduct of public business. Almost invariably, such attempts lead to the breaking up of Congress by armed force, or to the arrest of the outspoken members, and their torture, court-martial, or murder."

"By a national election we mean a free choice of the voters in all the states, under elaborate precautions to protect and secure an honest ballot and a fair count. Such an election has not been allowed in Mexico more than twice in the ninety years of the Mexican Republic."

"There is no use, least of all for a disturbed country like Mexico, in ex-

pecting or demanding what we consider a good kind of government; or inferring that the Mexicans comprehend and possess good government simply because they use our current political vocabulary."

"The Mexican People are a group of human beings, the greater part of whom are as much shut out from any share in public life and the activity of the country as though they lived in the moon; a social system in which not more than one family in fifty has any influence upon the Government; a popular education which leaves five sixths of the population illiterate."

"The critical question is, what kind of people are those fifteen million? They are several kinds, for throughout the land live side by side two native races and an intermediate mixture, besides some foreign elements. About a fifth of the people of Mexico call themselves Spanish and perhaps a twentieth are really without Indian admixture."

"In Mexico there is officially no distinction of races. Indians are voters and may aspire to a governorship or the Presidency. Socially, also, there is little prejudice against color, black or brown."

"In reality the political people of Mexico are the whites, who, though only a tenth to a twentieth of the whole, own most of the property, furnish most of the business and professional men, and take to themselves most of the significant offices."

"How far the Mexicans could govern themselves is a problem, because every effort at self-government for nearly a hundred years has been broken up, either by the dictator of the moment or by somebody who wants to be the next despot."

"Another discouraging thing in Mexico is the national institution of peonage, which at its worst is practically slavery. The system is simple; a peasant or workman or miner is in your debt, or if not, you get him into debt; then he is bound to work for you until he extinguishes his obligation, you furnishing him supplies, keeping the books, charging him interest, and seeing to it that he never gets out of debt."

"What is the hope from education? Nobody knows, because the thing has not been tried. The Spanish schools were few and poor—though there was provision for higher education and scientific institutes. The Republic never organixed a system of education till after 1870—and their effect is not yet visible."

"With all these drawbacks, the cure for popular government in Mexico is not hopeless. Chili and the Argentine have pulled out of similar conditions. But there is little reason to expect betterment from the present dominant class in Mexico."

"What is the remedy for the confessed ills of Mexico? Can redemption come from the outside? * * * * Where is the energy and money to do for Mexico what the people of Mexico cannot do for themselves? On their

side they fear the United States and would fight to the death for the privilege of ill governing themselves."

(From an article by Albert Bushnell Hart, Professor of Government at Harvard University, *The World's Work*, January, 1914.)

"THE wealth of Mexico has always been its blessing and likewise its misfortune. The Republic to the south of us has the fatal gift of riches. Its gold led to the destruction of the old Aztec empire; its minerals and its other sources of wealth have ultimately brought about the present troubles. Just how hich Mexico is no one knows, for only small sections, here and there, have been made available. Its gold and silver mines are the resources that have chiefly attracted the popular imagination. Four hundred years of incessant working have merely scratched their treasures. Mines opened up by the immediate successors of Cortez are still yielding large returns every year. Mexico has produced one third of all the silver there is in the world at the present moment."

"Mexico has enormous stretches of agricultural land awaiting only the intelligent and industrious settler. Millions of acres, with the great American market at their doors, are ideally adapted to cattle and sheep grazing. Great stretches of forest contain not only pine, oak, and other ordinary construction timber, but the finest hard woods that grow only in hot climates—mahogany, rosewood, and other varieties. Mexico's oil resources, so far hardly tapped, may ultimately make the Republic the world's greatest producer."

"Though Mexico is very rich, Mexicans are very poor. This is the one conspicuous fact that so largely explains existing conditions. Here we have fifteen million people, placed in what Humboldt called the"storehouse of the world," and really enjoying little access to it. The Republic of Mexico nominally maintains sovereignty over several thousand square miles of territory; but sovereignty of a distracted kind, is about all it does maintain. The country in reality belongs to outsiders—to people who have never seen it, or visit it only occasionally. * * * * Outside of the baronial families that hold enormous tracts of land—for the most part undeveloped—and a small minority of the mercantile and educated classes, the average Mexican citizen is an Indian, either a pure blood or a half-breed, whose capital consists of a pair of cotton trousers, a cotton shirt, a gaudy blanket thrown over his shoulder, and an adobe hut into which he huddles his wife and children. The authorities differ as to the proportion between these two classes; the illiterates, however, probably represent not far from 10,000,000 of the total 15,000,000."

"The largest financial stake in Mexico is not Mexican at all, but foreign. And of this foreign interest, the largest part is American. * * * * The casual traveler in Mexico at once puts down the railroads as American investments. With a few exceptions Americans built them all. They are American in engineering and construction. * * * * Yet, when things are analyzed more in detail, Europeans are the largest holders of Mexican railroad securities."

(From an article by James Middleton, *The World's Work*, January, 1914.)

GEOGRAPHICAL NOTES

Cacti As Emergency Forage

Work was undertaken some years ago by the Agricultural Experiment Station of Arizona with an idea to determine primarily whether native cacti could be grown economically and in sufficient abundance on the lower mesas or desert ranges to provide dependable forage supplies for stock during prolonged droughts. At such times both feed and water are scarce and usually far removed from each other on the ranges. This work is an attempt, therefore, to point out a method of tiding over with an inexpensive though admittedly rough feed the periodic famines on the range which have proved so disastrous to successful stock growing in the Southwest. These lean seasons also make impossible any further development of this important industry until effective measures of one kind or another have been devised to meet this condition. From the uncertain nature of the rainfall there will always be droughts, which means occasional shortages of feed on the ranges, even with approved grazing methods. If these serious drawbacks to the stock business can be lessened to an appreciable extent by encouraging the growth of cacti or other resistant plants, or by other means possible to the rancher, it will be a matter of the greatest importance to the welfare of our stockmen.

Planting out a sufficient area of cacti, according to the extent of one's ranching interests, even at considerable initial expense, and encouraging the growth of plants already established on the ranges, will help to increase the amount of feed at all seasons, particularly during droughty periods. This would constitute a kind of insurance which thoughtful stockmen might avail themselves of during unfavorable years.

The Cactus is confined in its natural distribution to the New World. The species are most abundant in the southwestern parts of our country, embracing the states, Texas to California inclusive, and the northern half of Mexico. They are largely inhabitants of mild arid or semi-arid regions, particularly those characterized by periodic rainfall. They grow best with moderate precipitation, nevertheless they can endure prolonged drought with impunity.

The prevailing impression that cacti grow during droughts as well as other times, or that they can grow with almost no rainfall, is not correct; they must have a moderate amount of soil moisture. They get through dry spells by drawing upon their stored-up water.

In the early spring of 1904, during a drought of more than usual severity, the writer began a series of tests in burning off the spines of some of our native economic cacti to study the effect of rendering this class of forage more palatable for cattle. Upon beginning this work, impoverished range cattle in the vicinity began to eat greedily of these singed plants, divesting them of the last remnants of succulent growth. This continued

from day to day until, finally the appearance of the Experiment Station wagon was a signal for the cattle to collect and follow up the cactus burner.

Fortunately, the problem of grazing range administration does not depend alone for its solution on cactus forage. There are other equally promising means that may be brought into play to accomplish this same end.—[*Arizona Exp. Sta. Bulletin,* 67.]

Progress of Porto Rico in 1913

The remarkable progress which the Island of Porto Rica has enjoyed during the year 1913, together with a statement of the spontaneous development of its material and physical resources during the past 15 years, are contained in an interesting volume issued by the Bureau of Insular Affairs embodying the reports of the governor and other officials for the fiscal year just ended. The report shows that since 1901 the total foreign commerce of the island has increased nearly 500 per cent, in round numbers, the exports growing from 8½ millions to 49 millions; the imports from less than 9 to nearly 37 millions; while the balance of trade, adverse in 1901 by a small amount, is now more than 12 millions annually in its favor. Sugar still continues to be the chief factor of exportation though coffee growing has shown surprising increase. The foundation of a diversified agriculture has been laid and already oranges, pineapples, grapefruit, and other fruits form considerable items in the export figures. The development along educational and industrial lines and in public improvements are in keeping with the general progress of the island. This is well summarized in the words of Governor Colton, who states that the closing year of his administration "has been one of marked development, with industries more productive than ever before, and willing labor closely employed under improving conditions."—[*Bulletin of the Pan-American Union.*]

Commercial Cuba.

Marked prosperity prevails in Cuba. The foreign trade in 1912 reached $300,000,000, a gain of more than $6,000,000 over the previous year. The balance of trade is running strongly in Cuba's favor, for the exports exceed the imports by a million dollars a week. Of all goods purchased abroad, Cuba buys over half in the United States, and of all that the island sells abroad, 80 per cent go to the United States. Cuba's imports range over a wide variety of articles with no one item greatly in the lead, but the exports are notably specialized; sugar forms 65 per cent of the total. Tobacco exports are less than a third of sugar and no other item is large enough in amount to deserve comment. Cuba's trade is unusual in two respects,—nearly all of its exports go to a single country, the United States; and a single item, sugar, is twice as great in value as all other exports combined.

The Commerce of Chili.

Chili ranks as the third commercial nation of South America, with a foreign trade of $260,000,000. Imports slightly exceed exports; Great Britain

and Germany together control considerably more than half of the foreign trade. A single port, Valparaiso, handles half of the incoming trade, but only one-twentieth of the outgoing trade; the latter is almost wholly made up of mineral products, chiefly Nitrate (sodium nitrate) from the desert region of the north, and is shipped from the "nitrate ports."

Panama and the Canal.

In all America not one steamship has been launched for the foreign trade through the Panama Canal, but there has been considerable preparation for the new trade between the Atlantic and Pacific coasts of the United States. Our railroads are prohibited by law from engaging in the canal traffic.

When the canal is opened for traffic the American-Hawaiian Co. will have a total of 26 steamers of nearly 300,000 tons aggregate capacity. The company is chiefly engaged in the sugar trade between Hawaii and our Atlantic coast. At present it is using the Tehuantepec railway route across the narrow neck of Mexico, transhipping cargoes from ship to rail and again from rail to ship at either end of the railway. This fleet of the American-Hawaiian Company will be the largest distinctive cargo-carrying ocean fleet now borne on the registry of the United States.

The average lumber steamer engaged in the lumber trade between the Pacific Coast States and Europe costs $200 a day to operate, steaming 10 knots an hour. By using the Panama Canal, these carriers will save their owners $4,600 a trip as compared with the present cost of making the trip around the Horn.

The Republic of Panama contains about 10 people to the square mile, or about 40 to the square mile of inhabited land. The total population of the Republic in 1911 was 336,000 of whom 56,000 are called white. It is said that there are less than 2,000 pure-blood Caucasians in the country. Most of the people are varying mixtures of Indian, Negro and White.

The Outlook for Meat Production.

The outlook for meat production in the United States is far from being serious enough to occasion alarm, and the country is well able to meet the present deficiencies, which are due largely to important changes in our system of cattle raising.

Coupled with the rapid settlement of the grazing ranges and the division of these natural pastures into cultivated farms, has been the increase in the value of corn, which acted as a deterrent to corn feeding of cattle for market on the small farm. At the same time, the spread of diseases has militated against meat production, and has tended to lessen the supply of meat animals.

The farmer may not at once begin to raise meat cattle with profit; several preliminary readjustments of farm economy are necessary before the production of meat animals can be made a source of positive profit in the more settled sections.

The high cost of meat is a serious reality, and it is now obvious that the

rise in prices in recent years is the natural result of an actual shortage in production. This condition is reflected in the per capita consumption of meat in the United States, which is estimated to have fallen off 10 pounds in 4 years, or from 162 pounds in 1909 to 152 pounds in the fiscal year 1913.

The decline in beef production is especially marked. This is shown in three different ways—by the number of cattle on hand, the number received at market centers, and the number slaughtered. A decrease in market receipts and in the slaughter with a corresponding increase in the number remaining in the country would not be alarming; but when with a diminishing slaughter we are depleting our stock of cattle there can be no doubt of the gravity of the situation.

In the last six years the number of beef cattle in the country has apparently fallen off over 30 per cent, while the population has of course increased. According to estimates of the Bureau of Statistics of the Department of Agriculture, the beef cattle in the country on January 1, 1907, numbered 51,566,000, and at the beginning of the present year the number was only 36,030,000. Meanwhile the number of dairy cows has remained practically stationary.

The receipts of cattle at six of the principal live-stock markets (Chicago, Kansas City, Omaha, St. Louis, St. Joseph, and Sioux City) for the first 9 months of 1913, as reported in market journals, were slightly in excess of the receipts for the same period of 1912, but in comparison with 1911 there was a decrease of nearly 10 per cent.

The slaughter of beef under Government inspection, which covers more than half of the total slaughter of the country, shows a steady falling off since 1910, the total decline amounting to about 450 million pounds of dressed beef. Applying the ratio of Federally inspected slaughter to total slaughter according to the census figures for 1909, this means a falling off of approximately 780 million pounds of beef, in the entire slaughter of the country from 1910 to 1913.

With our diminished production in the face of the heavy demand and high prices of the home market we no longer have a surplus for export, and it is no wonder that our export trade in meat animals and products has declined heavily. Our once great trade with England in cattle and fresh beef has vanished, and the only considerable items now shipped to foreign markets are prepared hog products, such as bacon, hams, and lard. From 1904 to 1906, our exports of live cattle approximated 600,000 head annually. For the last fiscal year (1913) they numbered only 24,714, about one-tenth of which went to Great Britain.

Up to the present year our meat imports have been so negligible that they were not separately listed in the commerce returns. Shipments of beef have recently been received from Australia on the one coast and from Argentina on the other.

While future imports may afford some measure of relief, too much reliance should not be placed upon this source of supply. A study of the statistical

situation in other countries does not disclose where we are likely to obtain any large quantity of beef for an extended period. Besides our nearest neighbors, Canada and Mexico, the sources of imports are practically limited to South America (especially Argentina) and Australia. New Zealand exports large quantities of mutton but very little beef. Canada and Mexico do not at present give promise of substantial assistance. The number of beef cattle in Canada is only about one-ninth of that in the United States, and shows a steady decrease amounting to over 11 per cent in the last 5 years. Argentina and Australia are already supplying most of the British imports, and have been called upon to make up the loss in the supply formerly furnished by the United States. The Australian colonies, however, are sheep rather than cattle countries and export probably four times as much mutton and lamb (by weight) as beef. Argentina is a large producer and exporter of beef, but has apparently reached the limit of its present cattle resources. The number of cattle in that country showed a decrease at the last census (1911) as compared with the preceding one (1908). The report from Buenos Aires that 7,262,000 cattle were killed in 1912 out of a total stock of 29,000,000 indicates that Argentina is drawing on its reserve.

It appears that England alone could probably take all of the foreign beef available for export, to say nothing of the new markets which have already been formed in other European countries. We shall therefore have to bid against England and other purchasers of foreign beef and this competition will tend to keep up prices.—(*Bull. U. S. Dept. of Agr.*)

The British Channel Tunnel

"Once more the question of boring a tunnel under the British channel and facilitating travel, commerce and intercourse between Britain and France, as well as between Britain and Continental Europe generally, has been revived by engineers, newspapers and trade bodies. In 1907 the subject was vigorously discussed, and public opinion unmistakably favored the tunnel project. Military fears and pseudo-arguments prevailed, however, and the subject was dropped.

Today it is more strongly backed than ever before. It has found many new friends, and the most notable fact is the division of the military experts. They even argue that the tunnel would be a factor of strength in national defense, since it would enable England to import food during war with any other enemy than France, and would not leave the former to depend exclusively on her navy for such importation.

It is estimated that a channel tunnel would cost about $80,000,000. France would provide half of this amount and English capitalists the other half. What, then, are the objections to the proposals? They are these in the main:

That the "insularity" of Great Britain would be ended and an historical condition that has influenced every side of national life and character would be

suddenly changed, with all the risks implied in such a break with the past.

That a tunnel would expose Britain to the danger of a "surprise" in war —something she does not now fear, owing to the strength of her navy.

That France, now a friend and even an ally in a moral sense, may become an antagonist, nothing in foreign affairs being stable.

That, in any case, France may be defeated and crushed by Germany or a combination of several powers and the tunnel used by an enemy of England.

These objections seem strangely weak and superficial to the friends of the tunnel project, as well as to impartial bystanders."

Sugar In Argentina.

Five years ago Argentina employed an American, R. E. Blouin, director of the sugar experiment station at New Orleans, to superintend the promotion of the sugar industry in that country. He is director of the experiment station at Tucuman, about 1000 miles from Buenos Ayres, and in the extreme northwest of the republic. His contract was for five years, and recently it was renewed. Argentina's sugar output has grown from 91,000 tons in 1907 to 200,000 tons this year, and Mr. Blouin says this is enough to supply the country's needs. A majority of his principal assistants are Americans.—[*The Independent.*]

Government Investigation of the Marketing of Farm Products

It is announced that the Department of Agriculture, through its Office of Markets, will make a thorough study of what happens to produce from the time it leaves the producer until it reaches the consumer. A specialist on marketing perishable produce will investigate prices received by producers, cost of transportation and storage, change of ownership, accumulated charges, profits, and other elements. This specialist will then study conditions in various sections to determine the feasibility of a market news service dealing with perishable products, and also the best method of making statistics of supply and demand useful to the farmer or truck gardener.

Other specialists will give attention to studying cooperative organizations of producers and consumers, including cooperative marketing associations of farmers and buyers, cooperative stores, etc. They will make intensive studies of typical communities dealing with special products, and will assist in the formation of new cooperative enterprises. An expert in cooperative accounting will assist such organizations to keep their books and records effectively, establish cost systems, and follow up methods of handling goods en route and on sale.

Cooperating with the other investigators will be specialists in transportation—men who have had as much railroad shipping experience as Division Freight Agents—who will assist producers in securing proper freight rates, and will discuss questions of extending facilities, determination of rates,

routing, and other matters concerned with the speedy and cheap moving of produce to centers of wholesale and retail demand.

West Virginia Coal.

Negotiations, which began a year and a half ago, for the acquisition of extensive coal properties in the New River district of West Virginia by English capitalists, are now approaching completion. A syndicate led by Peter D. Millory, of London, is about to invest $50,000,000 there by the purchase of ninety-six collieries and 550,000 acres of coal land. These collieries now have an annual capacity of from 8,000,000 to 10,000,000 tons, and have been shipping 4,000,000 tons. The new owners will increase the output. It is estimated that there are 3,000,000,000 tons under ground in the tract which they are to acquire.

Another investment, involving $30,000,000, is to be made in this coal district by D. A. Thomas, of Wales, one of the largest coal operators in the world, and managing director of the Cambrian Syndicate. This transaction relates to thirty mines, whose output is about 2,000,000 tons, and to 150,000 acres of land.—[*The Independent.*]

The Panama Canal—Mr. John Barrett, Director General of the Pan-American Union, has written an attractive little book of 120 pages on "The Panama Canal, What it is and What it Means." It is published by the Pan-American Union, Washington, D. C. ($1.00 net.) It includes several maps in color, one showing the details of the Canal Zone. The illustrations are excellent, and the text is interestingingly written and should be authoritative.

The American coastwise steamship will be exempt from the Panama Canal tolls of $1.20 per ton of net register which will have to be paid by both American and foreign ships engaged in foreign commerce through the canal. As applied to merchandise this toll is equivalent to about 4 cents per 100 pounds or as applied to the great mass of bulk freight to only 2¾ cents per 100 pounds which is less than the lighterage charge on such articles across the river from New York to Jersey City.

THE YOGO SAPPHIRE MINES, MONTANA

The largest and most productive sapphire mines in the world are in southwestern Fergus County, Montana, about 50 miles from Lewiston.

The gems occur as disseminated crystals in an almost vertical dike of igneous rock about twelve feet thick and of unknown depth, and five or six miles long.

Sapphires were first found in gravels near the dike by prospectors in search of placer gold in 1885. There are at present two companies mining sapphires in the Yogo district. Both companies mine the same dike about two miles apart.

The dike material is mined by a tunnel system similar to that used in metal mines. The rock is blasted if necessary and then hauled to the mill in cars. At the New Mine the methods used for extracting the gems are a combination of those used in gold placers and the South African diamond mines. No crushing is employed for fear of breaking the larger crystals. The rock is dumped and by frequent wetting is caused to disintegrate. Then it is washed through sluices containing riffles and as the sapphires are heavier than the matrix they sink and are caught in the riffles. The undecomposed rock is then put through the same process several times before being rejected.

The American Mine has a more modern plant and the gems are separated on concentration tables very similar to the methods used in the concentration of low grade lead and zinc ores. It has been estimated that only 75 per cent of the sapphires are recovered by the sluicing process, while practically all of the large, and 95 per cent of the smaller ones are recovered in the Yogo American Sapphire Company's mill. This company also has a cutting and polishing department on the ground and it is interesting to watch a dull mineral turned by the skillful workmen into a beautiful gem. The process is very simple. The sapphire is simply cemented on a handle which can be adjusted by the operator to grind any face or angle of the gem, which is first shaped on a brass wheel covered with diamond dust and then polished on another wheel covered with diatomaceous earth.

The production of sapphires in 1911, including those mined by the Yogo American Sapphire Company in 1909 and 1910, amounted to about 88,477 ounces, of which about 86,000 ounces were culls for watch jewels, meter bearings and other purposes including a few that were crushed and mixed with diamond dust to cut the larger stones. The total valuation, in part estimated, was $215,313.

Most of the sapphires are bluish but some are white, light green, yellow, pink or straw colored. The largest ever found weighed 19 carats in the rough and 8 1-2 when cut. The prices vary with size and color, but recent offers of cut stones 1-2 carats in size were from $2 to $30 per carat.

The Yogo sapphires are not sold in Montana but are shipped to New York and London and there sold. The New Mine Syndicate ships about two tons of raw sapphires to London twice a year. There the sapphires are cut into gems and many are returned to this country for sale having to bear import duties of 20 per cent under the new tariff.

O. W. Freeman.

GEOGRAPHY AS A COLLEGE STUDY IN THE UNIVERSITY OF SOUTH AFRICA

The Committee of the Faculty appointed to prepare the syllabus of a course in Geography presented the following report and recommendation:

(1) That the subject of Geography be included amongst the subjects

for the B.A. degree, and that the following be an outline syllabus:

Astronomic Basis of Geography.—Planetary relations of the Earth. Determination of latitude and longitude.

Map projections and their properties.—Advantages and disadvantages of all projections in common use and of certain others which are useful for special purposes. Construction of maps on such projections.

Methods and Instruments of Surveying.—Geodetic, topographic, and magnetic surveying. Practical work with theodolite, level, prismatic compass, and plane table. Determination of altitude.

Meteorology.—Use of instruments, recording of observations, and interpretation of weather maps.

Climatology.—An intimate knowledge of the factors determining climate and of the climatic conditions prevailing throughout the world. Climatology of Africa in detail.

Physiography.—Earth sculpture and the forms produced by it under various climatic conditions. Physiography of Africa in detail. Oceanography. Earth movements and their record in the rocks. Methods of Palaeogeography.

Biogeography.—Life conditions of common animals and of important plants and the present distribution of such. Bearing of paleo-geography upon the latter.

Anthropogeography and Ethnology.—Characters, distribution, and migrations of the chief races of mankind. Dependence of characters and civilization upon physiographic environment.

Political and Commercial Geography of the World in general and of Africa in detail. Systems of government.

History of Geographical Discovery.

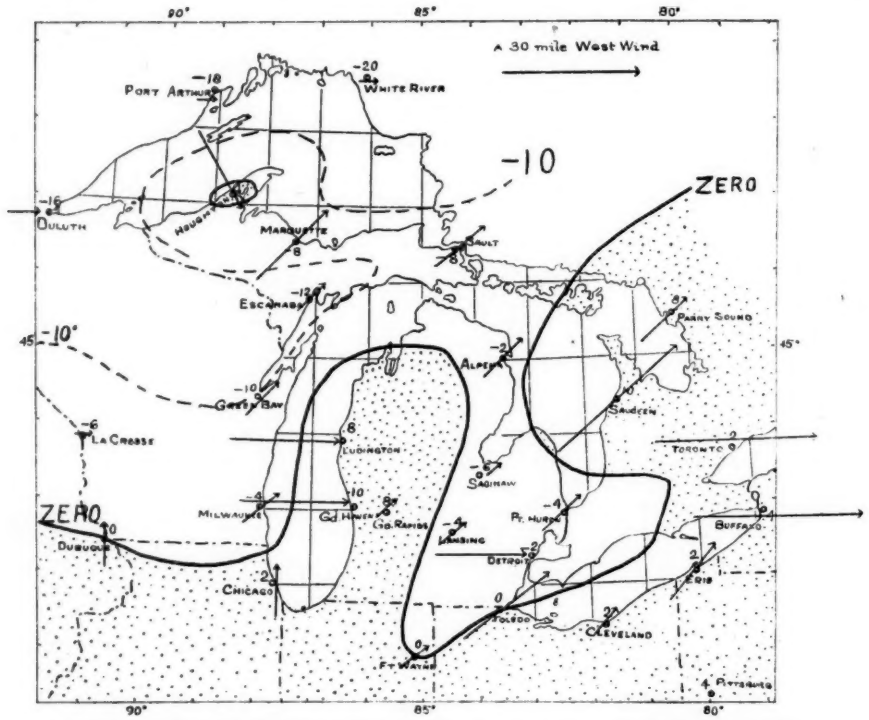
Economics in relation to Geography.

(2) That the present Intermediate Course in Geology serve as an introduction to the B.A. Course in Geography as well as to that in Geology.

THE GREAT LAKES IN A COLD WAVE.

The cold wave that descended on the Great Lakes on the morning of February 9 afforded an excellent illustration of the influence of broad water surfaces on extreme temperatures. The facts are given on the daily weather map for eight a. m., Washington time, and are reproduced in the adjoined sketch. The east shore of lakes Michigan and Huron had temperatures above zero. These regions are stippled on the map. The west shores were all below zero, thus Escanaba, Green Bay, and Milwaukee, on the west shore of Lake Michigan, had 12, 10, and 4 degrees below zero respectively, while Ludington and Grand Haven on the east had 8 and 10 above. So on Lake Huron the west shore points, Sault Ste. Marie —8, Alpena —2, Saginaw —6, Port Huron —4, and Detroit —2 lay opposite Parry Sound and Sau-

geen, which had 8 and 10 above respectively. Even more striking is the zero temperature at Houghton on Keweenaw Point, which extends from the south shore of Lake Superior, while Marquette had 8 below, Duluth 16 below, and Port Arthur 18 below. The lakes, of course, cannot fall below 32 degrees and this water modified the temperature of all places to leeward, for it will be noticed that this is really the effect of *wind*. The winds prevailing at the moment have been indicated on the map by arrows, the length of which is proportionate to the velocity in miles per hour. To give the scale, a thirty-mile west wind is put in at the upper righ hand corner of the map. It appears that at Houghton a twenty-mile wind was blowing over Lake



WIND AND TEMPERATURE, FEB. 9, 1914, 7 A. M. LOCAL TIME

Superior, at Ludington and Grand Haven a twenty-four-mile wind across Lake Michigan, which is here eighty miles wide, and southwest winds across Lake Huron and Georgian Bay blew upon Parry Sound and Saugeen with a velocity of fourteen and thirty-six miles per hour respectively; all strong winds, under influence of the low pressure center then near White River.

This, of course, is a parallel to the mild winter temperatures provided in Europe by prevalent west winds from the Atlantic Ocean. The important role played by winds in the cold wave referred to is shown by the data of the day following, when the anti-cyclone was north of Georgian Bay and the temperature at Houghton fell to —16. Instead of a twenty-mile wind from

the northwest it had a four-mile breeze from south of east. Parry Sound, now 14 below zero, gets eight miles of wind from the northwest and Saugeen is 2 below with twelve miles of wind from the northeast. At the four Lake Michigan stations eight-mile breezes were blowing from the east and northeast at Ludington and Grand Haven, from the northwest at Green Bay and Milwaukee; in all cases *toward* the lake, and Milwaukee was 2 below, Ludington 4 and Grand Haven 6. All these winds represent *indraft* toward the warm lake and all of them were weak. A similar indraft towards Lake Huron caused northwest winds at Alpena, Saginaw, Port Huron, and northeast at Saugeen. The low area at this time was far off in New Brunswick, and in the absence of strong westerly winds sharp contrasts in temperatures between eastern and western shores had almost disappeared.

MARK JEFFERSON.

RECENT PUBLICATIONS

THE TEACHING OF GEOGRAPHY IN ELEMENTARY SCHOOLS By Richard Elwood Dodge and Clara B. Kirchwey. VII+248 pages 12mo. Rand, McNally & Co., Chicago and New York, 1913, $1.00.

It would be difficult to find in America two people whose training in educational geography and close contact with its problems so ideally fits them to write a book on Geography Teaching as Professor Dodge and Miss Kirchwey. The book shows a thorough maturing of ideas. There are no half-baked judgments. As you read you feel that you are reading the matured convictions of people who have thought their thoughts through, have tried out their experiments and have arrived at a reliable basis of judgment. The book advocates no fads or pet notions; it is, on the whole, conservative and is the better for it. Not that every experienced teacher will agree with every detail. For example, in Chapter six we are advised;—"In the study of cities, innumerable pictures should be shown." Pictures are a valuable aid in the teaching of geography, but for any given city a relatively few carefully chosen pictures are better than many. "Innumerable" pictures leave confused mental images, not vivid ones.

The discussion of the Use and Misuse of Maps is excellent. On the disputed question of teaching the details of industrial processes in geography, the authors say, "They are only very remotely if at all germane to geography." Undoubtedly true; it is also true that teachers find that from the standpoint of interest, a certain amount of this, conducted on the type study plan, is effective.

The sand table is granted a function in teaching geography, though not a very important one.

The habitual use of a text book is advocated, but with the advice that it is, as a rule, better not to have the text studied before the recitation period except after the pupils have been taught how to study.

The list of supplementary and reference materials is carefully selected and the "List of Equipment with Sources" is one of the best short lists yet published.

A teacher who is in search of ready-made devices, cut-and-dried "plans" and other predigested food for invalids will not find exactly what she seeks, but something much better, namely, a discussion of the teaching of geography, well written, based upon long and excellent experience and fundementally sound.

GUIDE TO THE STUDY OF ANIMAL ECOLOGY. By Charles C. Adams. XII+183 pages. The Macmillan Co., New York, 1913, $1.25.

The author disclaims any attempt to make the book an exhaustive treatment but says that his purpose is to indicate briefly some of the general bearings of the subject and a method of approach. The text discussions are brief. The value of the book seems to be in the remarkably full and well organized list of source-materials.

THE FOUR WONDERS,—Cotton, Wool, Linen, Silk. By Elnora E. Shillig. 137 pages. Rand, McNally & Co., New York and Chicago.

An attractive little book for the primary grades. It is the work of a teacher experienced in developing the minds of children through an appeal to their native interests. It is a happy combination of nature study, elementary study of industries, and geography.

THE CONTINENTS AND THEIR PEOPLE. SOUTH AMERICA. By J. F. Chamberlain and A. H. Chamberlain. IX+189 pages. One colorad map and 70 text illustrations. The Macmillan Company, New York, 1913, 55 cents.

This is the fourth book in the series of geographical readers, THE CONTINENTS AND THEIR PEOPLE, by the same authors. One chapter is given to the Continent as a whole; each individual country receives a chapter, and in addition a chapter is devoted to each of the subjects, the Amazon, Coffee, Cocoa, Buenos Aires, and the Turtle Islands. The chapters dealing with countries are brief, but give considerable more information than is found in the usual school text-book. The special chapters, such, for example, as the ones on the Amazon and on Coffee are enriched with interesting details. The simple language and direct style bespeak authors who are familiar with school children. Most of the illustrations are clear and tell their story well.

In some points, the facts are not quite down to date. Brazil, for example, no longer produces half of the world's supply of rubber, and her production of gold and diamonds has fallen to trifling values in the world's output. Iron is not yet mined to any considerable extent. A railroad of some length has been built around the rapids and falls of the Madeira River.

While the book seems much compressed, it will serve a distinctly useful end in that its low cost will put it within the reach of schools which might be unable to buy larger and more expensive supplementary readers.